

THE GREAT OMENTUM:

NOTES ON ITS DEVELOPMENT, ANATOMY,
PHYSIOLOGY, AND PATHOLOGY.

BY

W. McADAM ECCLES.



The peculiar fold or apron of peritoneum, apparently springing from the lower border of the stomach, and lying in front of the small intestines, is called the great omentum, or the gastro-colic omentum.

Of recent years it has been the subject of some close study with regard to its development, and has become of especial interest to the practical surgeon. There is, however, still some uncertainty as to its exact mode of origin, and a considerable lack of evidence as to its precise functions.

It will be my endeavour in the following paper to review our present knowledge concerning this part of the serous membrane under the following four headings: Development, Anatomy, Physiology, and Pathology.

I. THE DEVELOPMENT OF THE GREAT OMENTUM.

Many difficulties arise in connection with the investigation of the formation of the various folds of the peritoneum, which, as examined in the adult human subject, appear very intricate.

Two methods of observation are at our disposal: (*a.*) the examination of sections and dissections of embryos and foetuses in different stages of development; (*b.*) the inspection of the condition of the peritoneum as found in the fully developed state of the lower vertebrates.

In order to arrive at a right conclusion as to the steps by which the adult great omentum has been formed, it is very necessary to bear in mind the primitive disposition of the

alimentary tract and its supporting fold. In some of the earliest sections of the human embryo the intestine will be found to be a simple straight tube lying in the median line, and connected to the dorsal parietes by a simple continuous fold of peritoneum constituting the mesentery.

Very soon, however, the elementary straight intestinal canal grows in length, and of necessity becomes convoluted, and at the same time differentiated into the several parts which it later presents.

Such a simple, or at the most but slightly elaborated, condition persists throughout life in the amphibians, as for example the salamander, and even in higher vertebrates as the wombat.

What is therefore observable in the human foetus is the adult condition found in certain animals.

As the question under review here is that of the formation of the great omentum alone, it is unnecessary to enter into further and fuller details with regard to other parts of the peritoneum.

The stomach, which was originally placed vertically and in the median line, as it becomes more and more enlarged has a great tendency to take a position which is oblique, or even horizontal, and at the same time to fall over to the right of the spine, thus bringing its left-hand surface to look ventralwards, and its right-hand surface dorsalwards.

Now it is before the stomach has assumed this its final position that the first appearances of the great omentum will be seen, a fact which it is very important to remember.

Divergence of opinion will here be met with, and is probably due to the great difficulties which beset the way to an exact knowledge of the development of the gastro-colic omentum.

Professor Cleland,¹ in the year 1869, thus expresses himself: "The stomach turns over on its right side and assumes its subsequent form, the mesogastrium grows still more redundantly, and forms the pendulous omentum, while the free edge of the gastro-hepatic omentum does not grow proportionately, but remains as the anterior limit of the foramen of Winslow."

This extract is indefinite, and but little tends to put the early appearance of the omentum on a clear basis.

Cruveilhier,² in 1865, had advanced a more distinct statement, but I think a somewhat erroneous one. He says: "La portion de ce mésentère qui répond à la dilatation stomacale, peut être désignée sous le nom de *mésogastre*. Formé de deux

¹ Jour. Anat. and Phys., 1869, vol. iv. p. 198.

² Anat. Descrip., 4e edit. tom. ii. p. 537.

lames, dont l'une regarde à droite, l'autre à gauche, le mésogastre est fixé au bord postérieur de l'estomac, qui deviendra plus tard la grande courbure de cet organe.

"Longue celui-ci, de vertical qu'il était, se rapproche de la direction horizontale, le mésogastre, qui est obligé de suivre ce mouvement, devient horizontal lui-même et représente alors une cloison transversale, dont un des feuillets regarde en haut et l'autre en bas. . . . Mais, dans la suite, il s'allonge considérablement, et, pour se prêter à l'espace étroit qu'il occupe, il forme un pli, qui descend vers la cavité du bassin. Ce pli n'est autre chose que le grand épiploön."

In support of the above statements Cruveilhier gives two diagrams, proving without any doubt the exact meaning of his description.

Mr. Lockwood,¹ in 1884, following the above author, says: "The mesogastrium extends from the spine to the greater curvature of the stomach, and continuing to grow in a disproportionate manner, it forms a fold. This fold of the mesogastrium consists of two layers of peritoneum; it loops downwards from the stomach towards the lower part of the abdomen, it then ascends to the spine. In fact, the mesogastrium has become the great omentum." Mr. Lockwood makes use of Cruveilhier's diagrams. If the above could be accepted in its entirety, it would afford a simple explanation of the first appearance and subsequent development of the great omentum; but unfortunately it can hardly be considered to be in all respects a true account of what takes place.

In Cruveilhier's description given above, he very clearly says that when the stomach assumes its nearly horizontal position the mesogaster has necessarily to follow this movement of its enclosed viscus and itself to become horizontal, so that it presents an upper and a lower surface. A little closer examination into what really happens during this movement will, I think, show that it is by no means necessary that the mesogaster should become horizontal, or, as it is perhaps more correct to say, transverse.

The horizontal position of the stomach is not gained by what may be termed a *lateral flexion* of the organ, but by its pyloric end rising to nearly the same level as the cardiac end on an axis which is from before backwards. In other words, it is easy and rational to conceive of the above change without any tendency for the mesogaster to become horizontal, and, in fact, it does not become so.

¹ Jour. Anat. and Phys., 1884, p. 257. See also, however, Mr. Lockwood's description of the same in his Lectures on "The Morbid Anatomy, &c., of Hernia," p. 88.

This upward tendency of the pylorus is quite natural during the growth in length of the intestinal tract, but the change does not take place for some time after the stomach has turned over to the right.

It is therefore impossible, it would seem, to hold that the great omentum is the outcome of a pouching downwards (or caudalwards) of a horizontal (or transverse) mesogastrium.

If this view must be rejected, what other will take its place?

The lower mammals in some instances, as, for example, the two-toed ant-eater,¹ present an entirely different conception of the primitive condition of the great omentum.

Here it will be seen to be a pouching of the original longitudinal fold of peritoneum passing from the stomach to the dorsal parietes; but this bulging is towards the *left*, and only slightly downwards.

A like commencement probably holds good for the human embryo at about the tenth week of intrauterine life, or even earlier.

The rotation of the stomach over towards the right will naturally bring the laterally projecting pouch to appear to look in a *forward* and downward direction, and to later easily cover the anterior surface of the small intestine and transverse colon.

As the early representative of the great omentum is formed by the lateral bulging of the double layer of the mesogastrium, it is obvious that both the subsequent anterior and posterior layers of the great omentum are composed of two layers of peritoneum.

A careful examination of the early stages will show that this projection only takes place in that portion of the mesogaster which extends from about the middle of the greater curvature of the stomach to the region of the pylorus. The opening of the pouch subsequently becomes the foramen of Winslow.

As to the cause of this remarkable bulging into a bag-like pouch we are entirely in the dark.

The subsequent relationship of the layers of the great omentum to the transverse colon is excellently discussed by Mr. Lockwood in the paper quoted above, and no reference will be made to it here.

2. THE ANATOMY OF THE GREAT OMENTUM.

In the brief survey of the process of the development of the great omentum it has been noticed that this structure is com-

¹ Treves in Morris's "Treatise on Anatomy," p. 1039.

posed of four layers of peritoneum, two being, in the upright position, anterior, and two posterior, the latter having between them the transverse colon, and thus forming the transverse mesocolon.

Enclosed between the double anterior and posterior folds is part of a space known as the lesser sac of the peritoneum, communicating with the greater sac by means of the foramen of Winslow.

In the foetus the cavity of the lesser sac can be easily traced down into the dependent fold of the great omentum, but in the adult all four folds are usually completely welded together, so that the lesser sac becomes much reduced in extent.

It is an interesting fact that the great omentum is found in all the mammalia, and in many of the lower vertebrates.

In the newly-born child at full term it will be seen to be relatively much shorter than in the adult, thus showing that there is growth in the omentum after birth out of proportion to the actual growth in length of the body. Moreover, there is a tendency for the omentum to become longer, and therefore to hang lower on the left side than on the right, possibly as an outcome of its having commenced chiefly as a left lateral pouching of the mesogastrium.

As to the normal situation of the epiploön with reference to the small intestine, it is scarcely needful to say that the usual description of it as lying as an apron in front of the coils is frequently more diagrammatic than is actually the case.

Indeed, its relationship to the intestines and other viscera of the abdominal cavity varies very greatly in different subjects. In thirty-seven out of eighty-nine subjects I have examined,¹ the great omentum completely hid from view the small intestines when the abdominal walls were opened. This will be seen to be about 33 per cent.

All these were cases in which there was no apparent disease or abnormality of the great omentum or other part of the peritoneum.

Thus the great omentum may be said to be placed behind that part of the anterior abdominal wall which is unprotected by bone or a thick layer of muscular tissue.

In the bodies where the omentum was situated as above described, the greater bulk of it lay below the level of the umbilicus.

The actual length of the fold varies greatly; the extreme

¹ It must be remembered, however, that the position thus observed is that in which the great omentum was found *after death*. The cause of death may have perhaps a marked influence upon the relationships of the omentum.

limits which I have found, measuring from the lower border of the transverse colon, have been 3 inches to $13\frac{1}{2}$ inches.

Mr. Lockwood's observations¹ as to the extent to which the epiploön could be drawn down are of much interest and importance.

He found that in twenty cases under the age of forty-five years only one had the omentum long enough to project beyond the spine of the os pubis, and in only five others could it be brought down to the top of the symphysis pubis. After forty-five years of age it was the exception rather than the rule to find an omentum which could not be pulled beyond the lower limits of the abdomen.

What I have observed fully bears out the above statements.²

Various other positions may be assumed by the great omentum than that of lying evenly spread out so as to conceal the whole of the coils of the small intestine.

Out of the fifty-two cases not accounted for above, in the larger number the small intestine was to a greater or less extent exposed, chiefly at the sides, but also below.

In two cases, when the abdomen was opened, *nothing* of the omentum could be seen in its ordinary position, the small intestine being entirely uncovered.

In the first case, that of an old man of seventy-three, who died after fracture of ribs with subsequent left empyema, the organ, which contained an average amount of fat, was turned upwards, and tucked away between the under surface of the diaphragm and the upper surface of the right lobe of the liver. How this condition occurred it is impossible to be certain, but the fact that the patient, having a considerable amount of dyspnœa, was in a sitting or semi-reclining posture for nearly a fortnight before death may be taken as a possible cause. There were no adhesions anywhere, and the omentum could be readily pulled into its normal position.

In the second case the great omentum was rolled into a mass—easily unravelled, however, for there were no adhesions—and hidden from view, lying above the small intestines in front of the duodenum.

There was no apparent reason for this; but the position is worthy of notice for its bearing on some points in pathology, and probably the condition is not a very uncommon one when disease is present, but this is the only instance of it which I have seen where the omentum was healthy.

¹ *Op. cit.*

² See also an interesting table of twenty cases by Dr. Kenneth M'Leod. *Edin. Med. Journ.*, vol. xxiii. 1877, p. 23.

The actual position of the epiploön in the abdominal cavity is of course dependent upon a number of outside circumstances, such, for instance, as the dilatation of the stomach or transverse colon leading to shortening; the condition of the small intestines, distension pushing it upwards; the size of the liver, an enlargement producing a downward displacement; the age of the patient, as has been pointed out above; and whether there is any abnormal condition present within the abdomen, *e.g.*, ascites, ovarian and other tumours.

The lower margin of the fold is often said to be crenated or fimbriated, and this, I take it, is the usual form.

Its anterior surface is smooth, and moves with but little friction on the parietal peritoneum. The posterior surface is probably irregular, since the omentum fits into all the inequalities of the viscera against which it lies.

The thickness varies greatly, but is dependent chiefly upon the amount of adipose tissue it contains.

It may be excessively thin and transparent, especially in the young and emaciated: as age advances the tendency is towards a greater deposition of fat.

The arteries, which are large and numerous, and derived from the gastro-epiploic vessels, form very long loops with the veins which pour their blood into the right and left gastro-epiploic veins, the former being a tributary of the superior mesenteric vein, the latter of the splenic vein.

The nerves passing to the great omentum are branches derived from the solar plexus through the splenic and hepatic plexuses, and are distributed with the arterial branches.

Along the greater curvature of the stomach, and between the two anterior layers of the great omentum, lie some six or eight inferior gastro-epiploic lymphatic glands. These receive lymph from the inferior gastric lymphatics and the omental lymphatics, and discharge their lymph into the coeliac glands by vessels which pass between the pylorus and the pancreas.

3. THE PHYSIOLOGY OF THE GREAT OMENTUM.

Under this heading it is proposed to discuss the functions of the omentum. A good deal of uncertainty exists, again, as to the exact uses of this fold of peritoneum, but some may at least be surmised.

It is well, I think, to divide these supposed, or perhaps real, uses into two classes: (*a.*) those which may be termed the normal or true physiological functions, and (*b.*) those which the omentum performs when some pathological condition is present,

or what may perhaps, for want of a better expression, be termed its abnormal uses.

(a.) *The normal physiological functions of the great omentum.*

Most if not all of the following propositions as to the part played by the omentum in the economy of the human subject will probably be allowed to have some weight.

(i.) It serves as a protection to the intestines, possibly from external violence. This will appear more evident the thicker the omentum is.

(ii.) It acts as a heat-retaining covering to the viscera which lie behind it.

(iii.) It is a place where excess of adipose tissue can be temporarily or permanently deposited.

(iv.) The large surface which the great omentum presents, and the fact that it is so well provided with blood-vessels and lymphatics, constitutes it particularly well fitted for absorption of fluids.

(v.) It will allow of the more easy distension of the stomach and transverse colon, the former by recently received food, and the latter by fæces. Cruveilhier says: "Lorsque l'estomac et le colon sont extrêmement distendus, l'épiploön est réduit à une zone ou bordure plus ou moins étroite, qui longe l'arc du colon."¹

(vi.) Moreover, the intestines, owing to great changes in the amount of their contents, liquid, gaseous, or solid, and to their movements, must be constantly presenting very marked variations in their general surface form, and it is possible, nay, probable, that the omentum acts as a yielding surface fitting into the many irregularities to which its posterior aspect is presented. It is true that in the normal condition of the parts there is no real peritoneal space or cavity, and to maintain this state the omentum may be of service. In connection with this point it is important to remember that the omentum is in its more highly developed character found in the mammalia, and is therefore necessarily associated with a diaphragm. This muscular partition in its incessant movements during respiration is intermittently to some degree compressing the abdominal viscera, and it is possible that there may be some connection between these movements and the more pronounced development of the omentum.

(vii.) It is well known that the veins of the abdomen are capable of holding a very large proportion of the blood of the body, and they are said to become distended in cases of shock.

The veins of the omentum are considerable in their sectional area, and may be seen much dilated in cases of portal obstruc-

¹ *Op. cit.*, p. 534.

tion. It is probable that during digestion, especially that which takes place within the stomach, all the vessels of the mesogastrium are dilated, and consequently a very free blood-supply is given to the active organs.

Moreover, this increase in the amount of blood will also produce an increase in the amount of heat, which in itself may act as an assistance to rapid and thorough digestion, both in the stomach and in the small intestines covered by the great omentum.¹

(b.) *The abnormal uses of the great omentum.*

As has been stated, by this term "abnormal," it is intended to designate those uses of the great omentum which are in association with some abnormal or pathological condition.

(i.) The lower edge or border of the epiploön, as mentioned above, is usually scalloped, crenated, or fimbriated, though the extent of this peculiarity varies much in different subjects.

To this series of what may be termed "perpetual feelers" there seems to be allotted an important function.

Whenever any pathological condition of the abdominal viscera arises with a liability to local peritonitis, there appears usually to be a tendency for the great omentum, and particularly its lower border, to approach, if we may so say, the seat of inflammation, and to become adherent to the diseased spot.

There are numerous instances on record how this organ has, so to speak, sealed up perforating ulcers of the intestine, or has added an extra resisting wall to the exterior of an ulcer or abscess which was threatening to break into the peritoneal cavity.

I have seen several instances in both the living and dead subject of this conservative use of the omentum, particularly in reference to cases of diseased appendages in the female, and of appendicitis. Travers² found intestinal wounds in dogs frequently closed by omentum, faecal extravasation having been thus prevented.

Jobert gives a very remarkable case, where a young man was run over the abdomen, but had no subsequent symptoms pointing to injury of any of the viscera. He died suddenly from hæmoptysis two months after the accident, and on post-mortem examination a partial rupture of the small intestine was discovered which had been occluded by a plug of omentum projecting for half an inch into the gut.³

In this connection may be mentioned the now recognised use

¹ See an interesting paper by Hennecke, "De functionibus omentorum," 1836.

² Travers, "Process of Nature in Repairing Injuries of the Intestines."

³ See also Gross, "System of Surgery," 5th edit. p. 664.

of omental grafts after suture of wounds of the stomach and intestines, and for covering large ovariectomy and hysterectomy stumps.

Senn¹ remarks, in connection with this subject: "In almost all post-mortem examinations of specimens from operations on the intestine, I have observed that the omentum was adherent over a greater or less surface at the seat of suturing." In anticipating nature, Senn at first used omental flaps, but later found omental grafts did equally as well.

(ii.) Another and somewhat similar use of the omentum is that of preventing the protrusion of viscera, especially of small intestine, in the case of some penetrating wounds of the abdomen.

This is brought about in either of two ways: firstly, the omentum itself protrudes in a greater or less degree, and so plugs the wound, rendering it incapable of allowing intestine to become herniated; or, secondly, a thick omentum, even if not projecting into the wound itself, may effectually prevent the protrusion of any viscus behind it.

The occurrence of both of these conditions is of course dependent upon the seat of the wound and the position of the omentum within the abdomen. It is a remarkable fact that lesions of this description but rarely prove fatal, showing, I think, a real and applicable use of omentum under such circumstances.

A case of Baron Larrey's is recorded by Guthrie² in which an omental protrusion restrained hæmorrhage from the deep epigastric artery.

(iii.) Yet another, but a minor and probably much less frequent, use of the omentum may be mentioned. I refer to the protection which is offered by it to the intestine in an entero-epiplocele, especially when strangulation occurs.

Reference to this point will be made again later.

4. THE PATHOLOGY OF THE GREAT OMENTUM.

Many may perhaps not be able to agree with much which has already been referred to, and may, moreover, fail to see any utility in it, but a thoroughly practical division of the subject has now been reached.

The development of the omentum may be obscure, its anatomy given to much variation, and its functions uncertain, yet its pathological conditions are numerous and well-marked, as well as highly interesting and important. Even before birth

¹ Senn, "Intestinal Surgery," p. 172.

² Guthrie, "Wounds and Injuries of the Abdomen," p. 12.

the great omentum, in common with other parts of the peritoneum, may be the seat of disease.

It is a well-established fact that foetal peritonitis occurs, and while it usually involves the peritoneal membrane as a whole, yet its effect on the still but partially developed great omentum is worthy of notice. An inflammation of this kind may be caused by the exposure of the pregnant woman to cold and wet, but apparently most often occurs when she is the subject of gonorrhœa or syphilis.¹

This peritonitis may lead to adhesions within the abdomen, which may be afterwards the seat of internal strangulation in infancy, or to adhesions within a congenital hernial sac, especially those of umbilical ruptures.

A very good example of such an adhesion is recorded by Wrisberg.² A male child was born at the beginning of the eighth month. The right testicle had descended into the scrotum, but the left was arrested just without the external ring.

The child died a few days after birth. At the post-mortem examination, on opening the abdomen, the great omentum was seen to be drawn down into the left iliac region, and was united by three threads of adhesion to the tunica albuginea of the left testicle, "*tribus filis albugineæ testiculi accretum.*"

When the omentum was pulled upwards the testicle was raised coincidently.

This is an example of one of the many ways in which incomplete descent of the testis may be brought about.

Congenital diaphragmatic herniæ have been found with omentum passing through them.

In considering the various injuries and diseases to which the omentum is liable after birth, I shall perforce deal chiefly with the surgical aspects of the question, though allusion will be made to the very interesting diseases which are usually considered to be purely of a medical character.

i. INJURIES OF THE GREAT OMENTUM.

The omentum may be injured by external violence applied to the abdominal walls or to a hernial sac.

The lesions thus produced may be either subcutaneous, or a wound of the abdominal wall having been caused, omentum may be protruded injured already, or damaged after such protrusion.

¹ Simpson, *Edin. Med. and Surg. Journ.*, vol. 1. "On Foetal Peritonitis."

² Wrisberg, "*Commentarii Medici*," p. 229.

Subcutaneous lesions will here be noticed; wounds with herniation will be referred to under "Displacements of the Organ."

When the abdominal walls are subjected to blows from without, and especially in the so-called "buffer" accidents, it is easy to understand that if the omentum be lying in its usual position it will be exposed to injury.

Tears or splits more or less extensive have been found either post-mortem or on laparotomy for abdominal contusions.

Such injuries may be associated with laceration of other viscera, or may occur alone.

They are very liable to be attended with grave shock, even when no loss of blood of any moment occurs. This is probably due to the large supply of sympathetic nerves, and to the proximity of the solar plexus. Commonly severe hæmorrhage occurs, sometimes into the lesser sac of the peritoneum, where it may give rise to a well-marked swelling, which can be easily palpated.¹

In other cases the laceration has caused a part of the omentum to have its blood-supply cut off, with the result that gangrene has supervened.

An interesting case of this kind is given by Dr. Pitt,² in which a drunken man fell under a horse, and sustained a fractured clavicle, and complained of abdominal pain. Afterwards three days' vomiting ensued, and on the tenth day, while defæcating, he became suddenly collapsed, dying three hours later.

On post-mortem examination a slit was found in the lower part of the great omentum, causing a portion below it to become gangrenous, thus setting up fatal suppurative peritonitis. No laceration of any part of the intestinal tract was discovered.

The interest from a surgical point of view which attaches itself to these facts is the danger which division of omental adhesions in abdominal operations may produce in respect to the vitality of portions of the omentum. Several operations for resection of the pylorus have ended fatally from sloughing of surrounding tissues, including the great omentum.

It is certainly remarkable that an organ apparently so well supplied with blood should be liable to death after injury; but such being an undoubted fact, it has to be borne in mind when operating.

Omentum in a hernial sac is liable to be bruised or torn when taxis is roughly or improperly applied. Occasionally

¹ Brit. Med. Journal, 1859, vol. ii. p. 537.

² Ibid., 1889, vol. i. p. 893.

omentum has sloughed after it has been returned within the abdominal cavity, probably owing to laceration during the efforts made for its reduction, or its having been on the verge of gangrene before reduction.

There are cases on record in which foreign bodies have passed through the tissues and become embedded in the great omentum. A bullet¹ has thus become encysted, and in another instance a needle² two and a half inches long.

ii. DISPLACEMENTS OF THE GREAT OMENTUM.

Under this heading will be briefly reviewed the relationship which the great omentum bears to hernial protrusions. It will be well to discuss it under two headings.

(a.) The great omentum in connection with traumatic herniæ.

It has already been pointed out how the omentum may prevent herniation of abdominal viscera, but we now have to deal with the protrusion of omentum through wounds of the abdominal walls.

It is, of course, clear that some gaps made in the anterior wall of the abdomen are more likely to allow omental prolapse than others.

In analysing a large number of cases of penetrating wounds of the abdomen followed by projection of omentum, it becomes evident, as might have naturally been supposed, that the area which is most prone to be the seat of these herniæ is situated around the umbilicus, and chiefly below and to its left. In some cases of wounds of the diaphragm omentum has blocked the opening.

The amount of omentum which passes outside the abdominal wall varies much, and probably is determined by a number of circumstances of which the more important are the following:—The site, direction, and size of the wound, the position of the omentum within the abdomen, and somewhat the amount of exertion taken by the patient after the infliction of the wound.

The protrusion usually takes place directly after the wound is made.

The omentum which is protruded may or may not be injured. Other viscera may become prolapsed at the same time, or may be dragged down by the cord-like process of omentum.

The symptoms produced by the hernia may be very few, or even none at all. Vomiting, with pain, is perhaps the most

¹ New York Med. Journ., 1860, p. 246.

² Trans. Path. Soc., 1859, p. 93.

commonly present, and especially so if there be any dragging on the stomach.

The protruded mass is quite insensitive.

The prognosis of cases of traumatic hernia of the omentum is generally good unless some other injury complicate it: this is even so when no surgical treatment is adopted.

After the protrusion has occurred, adhesions very rapidly form between the edges of the wound and the neck of the projecting portion. This neck at the same time becomes more or less strangulated by the abdominal wall, with the result that the part beyond not infrequently wholly or partially sloughs.

If, however, the constriction be so slight as not to destroy vitality, plastic inflammation occurs, whereby the mass becomes what has not at all inaptly been likened to pancreatic tissue; granulations appear on the surface, and the tumour gradually dwindles away, the wound cicatrising and contracting, with subsequent permanent recovery of the patient beyond an adherent omentum.

This satisfactory result is probably brought about by the rapid formation of adhesions, whereby the general peritoneal cavity is shut off, and so acute septic peritonitis but rarely follows.

The treatment of such uncomplicated cases of omental protrusion is generally very simple and clear.

If the patient be seen soon after the injury, the omentum will be but little if at all congested. It will then be best—even if it be uninjured, and still more so if injured—to draw the omentum out a little farther, and to transfix and ligature a perfectly healthy portion and cut away the distal mass.

The stump and wound having been thoroughly cleansed with a warm antiseptic solution, the stump is to be returned to the abdomen, and the wound closed by carefully inserted silk or silk-worm gut sutures.

If, on the other hand, the case is seen some time after the accident, when the omentum is congested, inflamed, suppurating, or even gangrenous, the treatment will lie between removal of the mass by the ligature or the knife, or of leaving it alone, adhesions having been formed at the neck.

The protruding mass is certainly better removed in the earlier conditions by ligature or the scalpel, tying any vessels that may bleed.

The abdominal wound may be allowed to granulate.

(b.) The great omentum in relation to acquired non-traumatic herniæ.

The ileum and omentum seem to vie with the rest of the

abdominal viscera, and often indeed with each other, as to the privilege of being contained in a hernial sac. The situation of the omentum in front of the abdomen, between the parietes and the most movable part of the alimentary tract, accounts for its being frequently protruded in ruptures. Probably omentum is found in over one-third of all cases of abdominal herniæ. Thus it becomes of great importance in connection with ruptures.

Umbilical protrusions, on the whole, most constantly contain omentum; then inguinal, more particularly on the left side, and after that femoral, and again more frequently left than right femoral. This greater frequency of occurrence on the left side is explained by development, and the omentum hanging lower on that side.

As to age, it may be roughly said that omentum is much more likely to be present in old herniæ of old people, but it must be clearly understood that it is by no means infrequently protruded in recent herniæ in young subjects, and even indeed sometimes in children and infants.

Arnaud, in the last century, went so far as to say that omental herniæ did not occur before puberty, asserting that the great omentum was not found in the fœtus or in tender infancy.

This, however, is clearly an error, even though stated by such a close observer.

Omental hernia or epiploceles are often only quite small in size, and when larger but rarely attain more than moderate dimensions, never reaching the enormous protrusions of enteroceles or entero-epiploceles.

A reducible omental hernia is usually easily recognisable. The tumour is soft and of a doughy consistence, and at the same time compressible. The surface is uneven, and, if the omentum is hardened, may be nodular.

There is no tension or elasticity about the rupture. It is elongated and pyriform, and but rarely rounded. It can be handled freely without causing pain unless rather severe pressure against the ring be applied. Often a careful examination reveals that parts of the swelling are softer in consistence than others.

On reduction, it usually passes back into the abdominal cavity more gradually than intestine, and without a gurgle.

When omentum lies in a hernial sac, although it may be everywhere non-adherent, yet it may offer a decided bar to easy reduction on account of its tendency, so to speak, to crowd up in the canal, and hang about the internal ring.

In applying taxis, therefore, to such herniæ, it is well to

thoroughly draw down the contents of the sac first, and then, by placing the fingers and thumb of the left hand (or right, as the case may be), or the thumbs of both hands at the upper part or neck of the sac, prevent the mass of omentum from overlapping the margins of the ring in folds. Lifting the sac at right angles to the abdomen may sometimes help reduction, but the zigzag or side-to-side movement recommended by some is of but little value.¹

Omentum is very prone to become adherent to the walls of the sac, to other parts of itself, or to intestine within the sac.

Either one of these varieties of adhesions may produce simple irreducibility, or may become a band which may cause strangulation of some of the intestinal contents of the sac.

Adhesions about the neck of the sac in a pure epiplocele may lead to the complete shutting off of the cavity of the sac from the abdominal cavity. This may give rise to the absence of an expansile impulse on cough, and may lead to the collection of fluid within the sac—hydrocele of the sac. An ordinary pure epiplocele does give rise to an expansile impulse when the patient coughs. This is probably due to three causes—(1) descent of more omentum suddenly; (2) sudden turgescence of the omental blood-vessels; and (3) the increase in tension in the sac which is always caused by any action of the abdominal muscles.

Of course it must be remembered that the expansion is not nearly so well marked as in an enterocele.

The omentum contained in a hernial protrusion may remain unchanged in its anatomical characters, but not at all infrequently it undergoes very marked alterations. The pressure of the opening consolidates the omentum which occupies the ring, converting it into a smooth, round, firm mass. The bulk of it below the neck may become matted together into a mass, which will then be irreducible. This is brought about by adhesions, and also by the chronic congestion which is so common leading to a fibroid change.

In many instances, especially in old people who are fat, there is a deposition of adipose tissue. Thin persons may sometimes be the subjects of similar deposit. This will in most cases lead to irreducibility. In other epiploceles fat may be absorbed, especially when the patient is put on low diet, and continuous pressure applied to the rupture. An irreducible omental hernia may often by these means be rendered a reducible one. Sometimes omentum becomes cystic, and in very rare cases may undergo calcification.

¹ Macready, "A Treatise on Ruptures," p. 191.

Occasionally it may be affected when lying in the sac by sarcoma, carcinoma, or tubercle.

I have seen two instances of the latter deposit, both cases having at the same time tubercle of the peritoneum within the abdomen, and also of the sac wall itself.

In some cases the omentum has been almost separated from that in the abdominal cavity by the pressure of a truss, and has given rise to the belief in the presence of three testicles.

Omentum most commonly retains its normal relation to the intestine in an entero-epiplocele—that is, it lies in front.

There is a strong probability that omentum is protruded first, and gut follows after, coming down behind the epiploön.

This fact should be taken advantage of in the method of reducing such herniæ, for the part which descended last—the intestine—should be reduced first. Thus pressure should be made primarily on the posterior part of the contents of the sac.

In some herniæ the relationship between intestine and omentum may be altered.

Thus the latter may get drawn up on one side of the bowel, especially in large long-standing herniæ.

A coil of intestine in other instances may pass through a rent in a thin part of the omentum, and so appear anterior to it. This passage occasionally leads to strangulation.

Lastly, the omentum may come, through adhesions or otherwise, to practically surround the intestine, thus producing what has been termed an omental or second sac within the one formed of parietal peritoneum.¹

We now pass to an extremely interesting question of what occurs when omentum becomes nipped at the neck of the sac. A considerable amount of dispute has risen as to whether the strangulation of omentum alone gives rise to the classical signs of “strangulation.”

Such signs or symptoms may be stated to be:—

(1.) Vomiting, of a characteristic persistent gushing nature, firstly of the contents of the stomach, then bile-stained, and lastly fæculent.

(2.) Constipation, which is usually absolute, neither fæces nor flatus passing per anum.

(3.) Tension of the swelling.

(4.) The hernia is not spontaneously reducible, and cannot be reduced by the patient's efforts.

(5.) There is no impulse on cough.

(6.) The swelling is larger than it was.

¹ Richter, *Traité des Hernies*, p. 133.

(7.) There is pain in the hernia, and often, moreover, pain referred either to the spine or the region of the navel.

(8.) Distension of the abdomen.

(9.) Prostration comes on with typical abdominal facies.

(10.) Diminution in the amount of urine, or even inability to micturate.

Before entering into the discussion whether any or all of these symptoms are found in cases of constricted omentum, I shall refer to the published statements of some of the most eminent authorities who deal with the subject.

Lawrence,¹ in his "Treatise on Ruptures," appears to make some rather contradictory remarks, in my opinion, but they are so instructive that I venture to give them word for word.

In speaking of the symptoms of a strangulated hernia in which gut is evidently nipped, he deals with the subject of complete constipation, or, as he calls it later on, "insuperable constipation," and towards the close inserts this remarkable sentence: "It (*i.e.*, complete constipation) even happens *occasionally* in a mere epiplocele, where no intestine is protruded." (All italics are mine.) A few pages later he says: "An epiplocele is much less liable to strangulation than an intestinal rupture, and its immediate symptoms are milder and slower in their progress. In this variety of the complaint, stools may *generally* be produced by purgative medicines or clysters.

"The *connection of the omentum with the stomach* induces hiccup and sickness, and although the latter symptom *seldom* proceeds to stercoraceous vomiting, it exists to a most distressing degree, and particularly characterises the complaint.

"The symptoms are often influenced by the position of the body, being mitigated by bending, and aggravated by straightening the trunk.

"An epiplocele is occasionally accompanied with all the dangerous and alarming symptoms of an intestinal rupture, as insuperable constipation and *fæcal vomiting*."

Still later the following sentences occur: "An incarcerated epiplocele is the least dangerous, and indeed is seldom fatal. The sensibility of the omentum is not considerable in the natural state; it can bear much pressure without inconvenience, and it does not ordinarily excite alarming symptoms when inflamed."

The above quotations tend to show that "strangulated omentum," in the opinion of Lawrence, gives rise to symptoms which are more or less those of strangulation, but at the same time he makes use of expressions which seem to clearly indicate that

¹ "Ruptures," 5th edit. pp. 53, 57, 78, 448, 449, 454.

omentum may be nipped, and yet no "alarming symptoms" arise. Are the cases where these are present really purely omental?

Later in his invaluable treatise, Lawrence points out that "in a case which we have already diagnosed as an epiplocele, the symptoms of strangulation may be produced by the recent addition of *so small a piece of intestine as not to add to the apparent size of the tumour.*" This might almost be taken as an admission that a small knuckle of gut is generally the cause of the symptoms of strangulation. He further says: "A strangulated epiplocele is frequently presented to our notice with the tension and elasticity of an enterocele; these symptoms depending upon effusion of fluid into the sac."

He concludes with again making a very strong assertion as to the possibility of "strangulated omentum" giving rise to severe symptoms. "An omental rupture may experience such pressure at the moment of its formation as to cause acute pain in the part, extending to the abdomen, vomiting, constipation; in short, the symptoms of acute strangulation. . . . Often there is no distinction in the nature or severity of the symptoms between omental and intestinal ruptures, so that the most experienced surgeons have sometimes concluded wrongly from the violence of the disorder, particularly from the vomiting and constipation, that intestine must have descended in cases which they had formerly known to be simply omental ruptures."

When it is remembered, however, how difficult it is sometimes to be quite sure a sac contains only omentum, and that when the mouth of the sac is, as it were, kept open by a piece of omentum projecting into it, a portion of intestine may so easily slip by, it is most natural to conceive that intestine which is nipped is the real cause of the symptoms.

It is interesting to note that two authorities, Scarpa in his treatise, and Birkett in his article¹ on hernia, avoid any mention of "strangulated omentum."

Mr. Holmes, however, in his work² writes: "The strangulation even of omentum only produces symptoms identical in kind with those of strangulated bowel, though possibly not so severe, a fact which I find difficult to account for on purely mechanical principles, especially as the omentum when exposed in the operation for hernia is constantly tied tightly, in order to remove portions of it, with complete impunity." With regard to the effect of a ligature upon the omentum I shall allude presently.

¹ Holmes and Hulke, "A System of Surgery."

² Holmes, "Surgery: Its Principles and Practice," 2nd edit. p. 620.

More recently Mr. Macready¹ upholds the view of Mr. Holmes, although he mentions opposing statements: "A piece of omentum may be strangulated and accompanied by symptoms which cannot be distinguished from those of constricted intestine."

"It is generally admitted that the symptoms to which strangulated omentum gives rise are usually of less severity than when bowel is included"—the vomiting is less frequent, and less copious, and the bowels may act unless peritonitis comes on.

Again, Mr. W. H. Bennett² says: "It is a notorious clinical fact that strangulation of herniated omentum is generally associated with constipation of the most obstinate kind, and frequently with all the other symptoms of strangulation."

He gives the notes³ of a very interesting case, however, in which there were no symptoms of strangulation besides pain, and no true hernial impulse; and yet when he performed herniotomy, the sac was found to contain a large mass of omentum, congested throughout, at the back of which was a small area of commencing gangrene.

Lastly, I will quote on this side of the question Gosselin, who says: "Tout à coup la tumeur devient plus volumineuse; si elle était réductible, elle ne se réduit plus; elle devient chaude, douloureuse à la pression et pendant les mouvements. En même temps apparaissent quelques coliques; parfois, mais pas toujours, des nausées et quelques vomissements, dans un certain nombre de cas même la constipation."

I now turn to the statements of Mr. Rushton Parker,⁴ who is opposed to the view that nipping of omentum *per se* leads to symptoms of strangulation. "Strangulated omentum," he says, "can have no symptoms, and that in cases where signs of strangulation are present a loop of bowel has been strangulated, or some other cause of obstruction is present."

M. Paul Berger,⁵ in commenting on the statement of Gosselin given above, writes: "Telles sont la physionomie et la marche de ces accidents, et c'est un des principaux mérites de Malgaigne d'avoir prouvé et proclamé très haut qu'ils reconnaissent pour cause l'inflammation de la hernie et de l'épiploön qu'elle renferme, la peritonite herniaire et l'épiploïte, et qu'ils n'ont rien de commun avec l'étranglement, dont la condition formelle est la présence de l'intestin dans la hernie."

¹ Macready, "A Treatise on Ruptures," p. 349.

² Bennett, "Lectures on Abdominal Hernia," p. 12.

³ Op. cit., p. 2.

⁴ Parker, "Abdominal Hernia," p. 17. See also *Lancet*, 1876, vol. ii. p. 219.

⁵ Berger, "Traité de Chirurgie," tom. vi. p. 625.

While perhaps not agreeing with Berger that all the symptoms are due to inflammation of the omentum, it is clear that he does not consider mere nipping of omentum as sufficient to cause symptoms of strangulation.

Later he continues: "Les phénomènes des l'épiploïte ne sont jamais ceux des étranglements: les vomissements sont rare et ne prennent jamais le caractère fécaloïde.

"Presque toujours les malades émettent spontanément des gaz par l'anús; quand on a recours à l'action des purgatifs, ceux-ci prouvent aussitôt des évacuations. Nous passerons sur la localisation de la douleur au pédicule de la hernie, qui est la règle dans l'étranglement, qui fait défaut ou n'est pas plus marquée qu'ailleurs dans l'épiploïte, et sur la moindre tension qui caractérise cette dernière car ces caractères peuvent induire en erreur.

"Mais jamais l'inflammation d'une epiplocele ne détermine la réaction générale, les phénomènes nerveux, l'anxiété, l'état de dépression, d'hypothermie que présentent les sujets atteints d'étranglement intestinal.

"On a bien cité des cas où tous les phénomènes de l'étranglement avaient été observés pendant quelque temps et dans lesquels, à l'ouverture de la hernie on n'a trouvé que l'épiploön: mais comme il y avait eu toujours des efforts violents et prolongés de taxis et qu'il est même dit expressément dans un certain nombre de cas observations que la hernie avait diminué de volume après ces tentatives de réduction, il est probable que les apparences de l'entrapement étaient dues à ce qu'une petite anse d'intestine se trouvait comprise dans le hernie, que c'était elle qui avait été le siège des phénomènes d'incarcération, mais qu'elle avait été réduite et que l'épiploön seul était resté dans le sac."

I have quoted the above at such full length because it so entirely states my opinion on the subject, and what I have observed clinically.

Having thus given the views of several authors, it remains to be seen how the symptoms analogous to, or identical with, those of strangulation may be accounted for, when by operation omentum only is found in the sac. It will be seen that I here allow that such symptoms do occur in these conditions, but by no means always.

Firstly, then, I may repeat, I do not think them due to the mere nipping of omentum at the neck of the sac. My attention was first directed to the subject by a case which I saw when a dresser, where a young man with a recent hernia had all the ordinary symptoms of strangulation, and when the sac was

opened omentum only was found; congested but not gangrenous; in fact, a case similar to the one recorded by Mr. Bennet.

The symptoms were put down to the strangled omentum, and it was ligatured after being transfixed, and cut off, the stump being returned to the abdomen. All the symptoms of strangulation disappeared at once, and the patient made a good recovery.

Yet the case was a puzzle to me, and, like Mr. Holmes, I could not reconcile the intense strangulation by a ligature and cessation of symptoms, with the lesser nipping and their appearance.

Lawrence says:¹ "If strangulation of the omentum by the ring is sufficient to produce dangerous symptoms and mortal consequences, must they not be equally expected from that stricture which is caused by ligature?" And *a priori* one would think so; yet how many times has omentum these later years been ligatured with no ill results?

It must be admitted, however, that sometimes, but very rarely, symptoms such as vomiting, &c., do follow omental ligature, but pass off quickly; in fact, Mr. Bennett² urges this as an argument in favour of pure epiploceles when strangulated producing symptoms.

These latter cases, however, are open to the explanation that other causes of vomiting, pain, &c., may be present, such as the effects of the anæsthetic, tension in the skin wound, &c.

Scarpa also considered that ligature of omentum was a highly dangerous proceeding, and likely to produce symptoms resembling those of strangulated bowel, for he advises that the omentum in a case of herniotomy for strangulated hernia, if it be not in a fit condition for reduction, should be allowed to form adhesions in the wound, and then that the excess may be ligatured and cut off with safety. This method, on the face of it, appears to be a contradiction, and yet it gave good results.

What, then, was the cause of these symptoms following ligature and reduction of the stump in his days, and their absence in these? Simply that the ligature was septic, and set up peritonitis with its accompanying symptoms—those of bowel obstruction—and not because the omentum was constricted.

Such a cause may even happen in the present day.

By allowing inflammatory adhesions to form, the general cavity of the peritoneum was shut off, and the ligature, which still *constricted*, could be applied safely. It has been urged

¹ Op. cit., p. 454.

² Op. cit., sect. viii. p. 142.

that in strangulation there is venous congestion and great nerve irritation, which are not present in simple ligature. I cannot, however, bring myself to believe the difference can be of much moment.

If constriction, then, is not the factor in producing symptoms of strangulation, there must be other causes present.

Mr. Rushton Parker¹ gives three :—

(1.) Cases where taxis has been applied, but the symptoms have not been entirely relieved. Herniotomy has been subsequently performed, and only omentum has been found in the sac.

These may be explained by the reduction of the nipped intestine by the taxis, but followed by its tardy or incomplete recovery.

(2.) Cases in which no bowel has been protruded, but in which the herniated omentum has dragged upon the stomach and transverse colon, so as to irritate the former and kink the latter. Mr. Bennett also refers to this dragging as a factor.

(3.) Cases of inflamed omental herniæ, with or without accompanying intra-abdominal peritonitis.

To these I would venture to add three other possible cause, viz. :—

(4.) Cases where a very small piece of bowel—"une petite anse d'intestine"—was hidden by the omentum, and actually returned during herniotomy without being noticed.

(5.) Cases where another cause of intestinal obstruction is present within the abdomen. For instance, Mr. Bennett cites a case where a thin and tense pedicle of omentum constricted the bowel near the ring, but within the abdominal cavity.

(6.) Cases where a patient has an omental hernia, and is the subject of attacks of colic or constipation; it might be possible that one of these should be mistaken for an example of strangulation of omentum producing symptoms of itself.

The effects of nipping of the omentum upon the viscus are congestion, inflammation, suppuration, and gangrene.

When the sac is opened, blood-stained fluid will flow out, and the omentum will be found to be more or less altered in its appearance. Often it is very greatly engorged, with its veins enormously distended. At other times an actual slough has formed, and on incision of the omentum no bleeding will occur.

In certain cases drops of oil have been set free from gangrenous omentum, and may be found floating on the liquid within the sac.

¹ Op. cit.

In a strangulated entero-epiplocele, the gut, coming down last, and being in many cases the cause of the strangulation, is the first to suffer, unless protected by the omentum as it occasionally is.

In one case the omentum was found gangrenous, but the bowel only slightly affected.

Omentum, if at all altered by the constriction, should always be carefully ligatured, adhesions, if any, having been previously separated.

The ligature must be applied to a sound part of the organ, which for that purpose may be gently drawn down.

Transfixation is to be practised, and the breadth of the omentum tied by a series of interlaced ligatures. The knots should be secured as tightly as possible, and without there being any strain or drag on the omentum when they are completed.

This is a very important point, for I have known two cases die of hæmorrhage owing to the slipping of a ligature after reduction of the stump.

Thoroughly aseptic (boiled) silk is, I think, the best material for ligature. Three and a half pounds of omentum has been successfully cut away in this manner.

Healthy omentum, if small in amount, may be returned into the abdomen, but care must be taken that the reduction is complete.

Rarely omentum may become either inflamed, or even gangrenous, after reduction, and it by no means infrequently becomes adherent. Gangrene within a hernial sac also sometimes spreads to omentum within the abdomen.

Inflammation of omentum in a hernial sac is by no means uncommon, and, as has already been mentioned, may give rise to some difficult symptoms from the point of view of diagnosis.

It occurs from causes which would produce peritonitis elsewhere, but is especially liable to follow injury.

It may end in resolution, in suppuration, or in gangrene. It may be confined to the sac, or may extend to the abdomen.

It should be treated by putting the patient in the recumbent position, supporting the rupture, and applying hot fomentations to it, and prescribing small repeated doses of opium.

Before leaving the question of the relationship of omentum to herniæ, it is necessary to mention that occasionally holes form in adherent omentum, and in laparotomies for tumours it is important to ligature such adherent omentum on each side of the hole, for if a hole be left, a piece of bowel may become strangulated by it.¹

¹ Doran, "*Gynæcological Operations*," p. 212.

Very rarely a loop of intestine may become strangulated in the foramen of Winslow, an aperture formed in the development of the great omentum.

In performing the operation for radical cure on an epiplocele, or entero-epiplocele, it is certainly a bad plan to fix the stump of ligatured omentum in the ring, for by this means adherent omentum is produced, which is always liable to form a band which may give rise to obstruction, and the attachment to the hernial orifice will probably defeat the very object for which the operation was undertaken, namely, the cure of the rupture.¹

iii. DISEASES OF THE GREAT OMENTUM.

Within the abdominal cavity the great omentum is liable to a considerable number of pathological conditions.

(a.) Adhesions are very common. They are practically always the outcome either of inflammation of the peritoneum itself, or of some viscus, whether otherwise normal or the seat of a new growth.

For instance, general peritonitis may produce extensive adhesions of the epiploön, and an ovarian tumour, especially if it becomes inflamed, may cause the omentum to attach itself to the cyst over a large area.

Such omental adhesions can be fairly easily dealt with, for they give rise to much less trouble than adhesions of intestine to the tumour.

A case is mentioned by Vincent Jackson² in which, during ovariectomy, an area of omentum 15 inches by 4 inches had to be removed.

The omentum, by adhesions, may in some rare cases draw the ovaries and tubes up out of the pelvis, but much more usually the omentum is drawn down into the pelvis.

The breaking down of omental pelvic adhesions in exploratory laparotomies may be, and probably is, a cause of the relief to symptoms which not infrequently follows such operations.

(b.) Inflammation of the omentum is commonly part of a general peritonitis. If chronic, it is often due to tubercle. This form is particularly interesting from the frequency with which the condition simulates or is associated with a tumour.³

This is due to puckering and rolling of the omentum until it lies as an elongated firm mass attached to the transverse colon, and athwart the upper part of the abdomen.⁴

¹ Treves, "A Manual of Operative Surgery," vol. ii. p. 520.

² British Medical Journal, 1885, vol. i. p. 1295.

³ Osler, "Principles and Practice of Medicine," p. 238.

⁴ Compare a case quoted under "Anatomy," in an earlier part of the paper.

A similar cord-like structure may be formed in cancerous disease of the omentum, but is said to be much more common in tuberculosis.

Gairdner has called especial attention to this swelling. In children it generally undergoes gradual resolution.

A resonant percussion-note may sometimes be elicited above the mass. Though usually situated in the umbilical region, the omental mass may form a prominent tumour in either iliac region.

(c.) Tumours of the great omentum may be either cystic or solid.

(i.) Cystic tumours of the omentum.

[a.] *Serous*.—This is generally the outcome of peritonitis, leading either to a collection of fluid in the lesser cavity of the peritoneum or encysted by adhesions.¹

I have seen one such case, where the signs closely resembled those of an ovarian cystoma.²

Other cases are instances of lymphangiectasis of the great omentum.³

Removal of the fluid by aspiration after laparotomy may effect a cure, or, if feasible, the cyst itself may be removed, with or without portions of the omentum.

[b.] *Hydatid*.—Usually multiple, and perhaps studded over the peritoneum. Enucleation cures some cases.

[c.] *Chylous*.—The outcome of dilated lymphatics or chyle channels.

[d.] *Dermoid*.—These may arise in two ways, either, as Mr. W. G. Spencer has suggested, from “cœlomic tissue,” or they may be merely ovarian dermoids to which the omentum had become adherent, and subsequent separation from the primary seat of their origin has resulted. This is the opinion of Mr. Knowsley Thornton, Mr. Bland Sutton, Mr. Alban Doran, and others.

Their obvious treatment is removal.

[e.] *Pancreatic*.—It is not my intention to enter deeply into the highly interesting subject of pancreatic cysts, but merely to refer to such points concerning them as have a special connection with the great omentum and the lesser peritoneal sac.

In passing, however, it may be said that there are three probable origins of such cysts:—

[i.] Injury. The pancreas, although situated quite at the

¹ See a specimen in Museum, R.C.S., No. 1109, where a small cyst may be seen between the two layers forming the anterior part of the omentum.

² See also a case of Dr. Bantock's recorded in *Obstet. Soc. Trans.*, 1881, p. 164.

³ *Brit. Med. Journ.*, 1894, vol. ii. p. 532.

posterior part of the abdomen, and apparently well protected, is, however, occasionally lacerated by kicks, blows, &c.

This laceration will lead to some extravasation of the secretion of the organ, and this occurring with some amount of hæmorrhage causes irritation, and thus the production of an inflammatory cyst wall. Senn has said that pancreatic fluid is non-irritating to the normal peritoneum, but this does not necessarily hold good in the conditions under which it is poured out in cases of traumatism.

[ii.] Inflammation, and consequent stricture of the canal of Wirsung, may occur during or after inflammation of the duodenum. Stricture of the duct may also possibly result from its laceration. In both cases fluid may collect distally to the narrowed part.

[iii.] A cavity containing fluid may be formed by the digestive or corrosive action of pancreatic fluid on the tissue of the pancreas which is already the seat of disease.

The great omentum will be found lying in front of the cyst in whatever way it may have been caused.

A traumatic origin is, however, probably the commonest, and the situation of the fluid in such cases is of great interest.

It should here be noted that pancreatic cysts have a great tendency, when caused by traumatism, to have blood extravasated into them. In such cases the fluid may be (*a*) free within the lesser sac of the peritoneum, and possibly actually distending this cavity pretty considerably. Here in the primary lesion it is probable that the layer of peritoneum forming the posterior wall of the lesser sac was torn, and allowed the extravasation to take place into the cavity in front of it. This view is upheld by Mr. Jordan Lloyd,¹ and in support of it he quotes an instance where, on post-mortem examination, he found a considerable portion of the pancreas gangrenous, detached, and free, lying in a collection of fluid contained within the lesser cavity of the peritoneum;² (*b*) or the fluid may be in the loose extra-peritoneal tissue behind the lesser sac, when it will usually be but little in amount; (*c*) and lastly, it may be between the layers of the transverse mesocolon. Here this portion of the bowel will be displaced downwards.

In the first position the stomach will be stretched over the front of the cyst, while the transverse colon will be pressed backwards. These relations are of importance in the question of diagnosis.

¹ British Medical Journal, 1892, vol. ii. p. 1051.

² See also a valuable paper by Dr. Theodore Fisher, Guy's Hospital Reports, 1893, vol. xlix.

Pancreatic cysts are best treated by performing laparotomy, and either securing the cyst to the abdominal wall and draining, or by dissecting out the cyst. Simple aspiration has sometimes proved a successful method of cure.

[*f.*] Hæmorrhagic. Here again blood may be found in the cavity of the lesser sac of the peritoneum, or in the substance of the great omentum itself.

The causes of such extravasations are chiefly traumatism, hæmorrhage into pancreatic cysts, from a rupture of one of the gastro-epiploic veins, especially in portal obstruction, and from acute and gangrenous pancreatitis.

When the lesser sac is distended with blood, besides the symptoms of internal hæmorrhage, a tumour can usually be palpated, or mapped out by percussion, which reaches down a little below the umbilicus, rather lower on the left than on the right side. If the normal cavity of the sac be distended with plaster of Paris or gelatine, it will be found that the stomach is pushed in front and compressed between the mass of injection and the anterior abdominal wall, while the transverse colon is pushed backwards against the spine. The position of the former may be determined by distending it with gas.

M. Simon¹ records an interesting case of a man who died of cholera, in whose abdomen a cyst in the great omentum containing altered blood was found. This during life had given rise to the erroneous idea of a distended bladder.

No cause for this extravasation could be discovered; the gastro-epiploic vessels were apparently quite healthy.

Old blood cysts may be dissected out, or removed with portions of omentum, or drained.

Recent hæmorrhages are best left undealt with surgically.

[*g.*] Lastly, there are abscesses. These are most commonly the result of a perforating gastric or colic ulcer with subsequent localised peritonitis. A blood cyst may suppurate. The pus may be within the lesser sac, or between the omentum and the anterior abdominal wall.

Incision and drainage is the only treatment, but the cases often end fatally.

(ii.) Solid tumours of the omentum. These may be classified as innocent and malignant.

The *innocent* growths include:—

[*a.*] Lipoma.

[*b.*] Fibroma.

[*c.*] Myxoma.

Of these, lipoma is the commonest. It is only natural that

¹ Bulletin de la Société Anatomique, 1858, p. 30.

a tumour composed of adipose tissue should at times occur in the omentum.

Rarely it grows to a very large size, and simulates to a certain degree an ovarian tumour.

Dr. Meredith¹ records a case where he removed one weighing fifteen and a half pounds.

The *malignant* growths are :—

[a.] Carcinoma.

[i.] Endothelioma.

[ii.] Scirrhus.

[iii.] Colloid.

[b.] Sarcoma. Generally spindle-celled.

Any of these malignant growths, except the so-called endothelioma, may be primary or secondary, but probably the majority are of a secondary origin.

Endothelioma springs from the endothelial cells of the peritoneum, and is therefore primary. It resembles the primary carcinoma of the lungs.

Colloid carcinoma, or the degeneration of a colloid form of the cells of other carcinomata, is a very interesting disease. The clinical features of a case are a gradual and great enlargement of the abdomen, more marked in certain parts than in others. The umbilicus is seldom everted, though it may be much stretched.

On palpation firm irregular masses may be felt over the region of the omentum.

Fluctuation, even if there be fluid present, is difficult to obtain, and always indistinct.

On percussion over the front of the abdomen, a large area will be found to be dull, and change of the position of the patient produces no alteration of its extent.

If an aspirator be employed, only some small quantity of a slimy gelatinous fluid will be withdrawn.

The omentum will be found to be very greatly thickened by the deposit.

Any radical treatment of such cases is of course out of the question.

In conclusion, a curious condition which is found in the omentum may be alluded to—I refer to what has been termed “fat necrosis”—on account of its having a bearing on surgery.

There are now several cases on record in which, because of symptoms resembling those of intestinal obstruction, the abdomen has been opened, and this peculiar condition of fat necrosis has been discovered.

¹ British Medical Journal, 1887, vol. i. p. 936.

Further examination of such cases has usually revealed gangrenous pancreatitis, a disease which is apparently often a cause of the necrosis, and therefore should be expected, if on laparotomy the omentum is found thus diseased.

This fat-necrosis consists essentially in the breaking up of the omental fat into glycerine and fatty acids. It may occur in adipose tissue elsewhere, but usually within the abdomen.

In some cases it has been stated that the result is brought about by the action of the bacillus coli communis, and also by a fungus present in the necrotic foci which closely resembles actinomyces. Dr. Rolleston has also suggested that it may be due to some lesion of the solar plexus secondary to hepatic disease.

The condition is a somewhat rare one, but may occasionally be extensive in its area, the great omentum usually being the situation where it is most apparent.